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Original Article

Are dysfunctional attitudes and beliefs about sleep unique to primary insomnia?

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ABSTRACT

Objective: Dysfunctional thinking about sleep is a central aspect in the perpetuation of primary insomnia and a target symptom of cognitive behavioral therapy for insomnia (CBT-I). Insomnia symptoms also occur in other sleep disorders, but it is not known to what extent it is related to dysfunctional thinking about sleep.

Methods: The Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS) was administered to inpatients at a sleep center. The following groups were included: 34 patients with primary insomnia (PI), 30 patients with sleep apnea syndrome (SAS), 31 patients with restless legs syndrome (RLS), 26 patients with SAS comorbid with RLS (SAS + RLS), and 24 patients with idiopathic hypersomnia or narcolepsy. Eighty-four healthy subjects served as a control group. The DBAS scores were compared across the different sleep disorders and correlated with polysomnographic (PSG) variables, subjective sleep parameters, scores of the Beck Depression Inventory (BDI), and the Regensburg Insomnia Scale (RIS; measuring psychological symptoms of insomnia).

Results: Compared to healthy controls, DBAS scores were increased in PI, RLS and RLS + SAS. There was a low correlation between DBAS scores and PSG variables, moderate correlations between DBAS and subjective sleep parameters and BDI scores ($r = 0.528$), and a high correlation between DBAS and the RIS score ($r = 0.603$).

Conclusion: The observation of increased DBAS scores in other sleep disorders besides primary insomnia underscores the usefulness of a broadened diagnostic procedure and suggests that CBT-I modules may be a complementary treatment tool for these disorders.

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1. Introduction

Patients suffering from insomnia adhere to beliefs that are characterized by fears about the negative consequences of insomnia and hopelessness [1]. These dysfunctional beliefs and attitudes about sleep have been operationalized [2] and were implemented in cognitive models of primary insomnia [3,4]. Correcting them has been recognized as a central aspect of improving sleep in insomnia patients [5,6] and can be successfully achieved by cognitive behavior therapy for insomnia (CBT-I) [7].

Insomnia as a symptom may also occur in other sleep disorders, e.g. sleep apnea syndrome (SAS) or restless legs syndrome (RLS) [8,9]. Here they deserve a specific treatment regime [10], for example CBT-I [11]. More detailed information about the presence of sleep-related dysfunctional attitudes and beliefs about sleep in other sleep disorders would facilitate insomnia-specific management strategies. However, evidence is lacking that would indicate to what extent dysfunctional thinking is also present in other sleep disorders, because studies about dysfunctional cognitions in insomnia were conducted predominantly by comparing insomnia patients to healthy subjects.

There are only two studies that investigated the presence of dysfunctional beliefs and attitudes in other sleep disorders: Carney et al. [12] administered the Dysfunctional Beliefs and Attitudes about Sleep Scale (DABS) to patients with primary insomnia and to patients with fibromyalgia, major depressive disorder, as well as to community sleep clinic patients with comorbid insomnia and mood disturbance. He reported that all groups had elevated scores. In another study it has been found that both dysfunctional thinking about sleep as well as arousal-inducing sleep-related behavior were more prevalent in sleep apnea patients with insomnia than in those patients without insomnia, regardless of the sleep quality [13]. These pilot data suggest that dysfunctional thinking is strongly associated with insomnia symptoms even in patients with sleep apnea.

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Table 1
Description of clinical samples.

Variable	Primary insomnia	Hypersomnia	Sleep apnea syndrome	Restless legs syndrome	Sleep apnea and restless legs syndrome	Healthy controls
No.	34	24	30	31	26	84
Age (years)	43 ± 15	32 ± 9	55 ± 11	51 ± 12	57 ± 9	47 ± 13
Women	62%	58%	27%	39%	19%	55%
AHI	4.3 ± 9.5	2.7 ± 4.4	30.3 ± 16.1	9.4 ± 9.4	33.7 ± 29.5	–
PLMI	19.2 ± 12.0	11.5 ± 14.2	23.3 ± 22.8	25.9 ± 19.9	53.4 ± 39.7	–
RIS	24.0 ± 5.2	11.4 ± 6.6	13.8 ± 5.2	16.1 ± 8.4	17.2 ± 7.3	–

Abbreviations: AHI, apnea hypopnea index per hour of sleep; PLMI, periodic leg movement index per hour of sleep; RIS, Regensburg Insomnia Scale score.
Values are mean ± standard deviation unless otherwise indicated.

To complete existing data, we systematically assessed the occurrence of sleep-related dysfunctional thinking in a sample of patients with different sleep disorders seeking help in an inpatient sleep clinic. In addition, we investigated its correlation with objective sleep variables using overnight polysomnography (PSG), subjective sleep variables, depressive symptoms, and the severity of insomnia-specific symptoms.

2. Methods

2.1. Participants

In total, 206 inpatients admitted for PSG to the sleep center of the Department of Psychiatry and Psychotherapy, Regensburg, Germany, during the period from September 2012 to August 2013 were screened for the study. After admission, all patients had a physical examination and an interview with a psychiatrist and a psychologist, both experts in sleep medicine. All subjects gave their informed written consent for participation in the study, which has been approved by the Ethics Committee of the University of Regensburg. The patients completed the Regensburg Insomnia Rating Scale (RIS) [14], the Beck Depression Inventory (BDI) and underwent one overnight PSG study. The sleep disorders were diagnosed based on the PSG results and the interviews according to the criteria of the International Classification of Sleep Disorders (ICSD-2) [15] and the guidelines of the American Academy of Sleep Medicine (AASM) [16].

Exclusion criteria for study participation were the following: severe psychiatric disorders such as major depression, parasomnia, severe neurologic disorders, an unclear diagnostic evaluation, and insufficient command of the German language necessary for completing the questionnaires. In addition, patients with incomplete questionnaires or PSG data were not included in the analysis. In the end, 61 patients out of all patients screened had to be excluded, resulting in a sample of 85 men and 60 women (mean age: 47.9 ± 14.5 years). They were assigned to five diagnostic groups (Table 1): (i) primary insomnia (PI), including 34 patients; (ii) hypersomnia (HYP), including 24 patients with idiopathic HYP or narcolepsy; (iii) 30 SAS patients with a mean apnea–hypopnea index (AHI) of 30.3/h (SD, 16.1); (iv) RLS with 31 patients, mean periodic leg movement index (PLMI) of 25.9/h (SD, 20.7); (v) SAS comorbid with RLS (SAS + RLS), 26 patients, mean AHI of 33.7 (SD, 29.5) and a mean PLMI of 53.4/h (SD, 40.0).

In addition, questionnaires were completed by 84 healthy controls without any signs of sleep disorders (Pittsburgh Sleep Quality Index ≤6). In this group no PSG was performed.

2.2. Measurements

2.2.1. Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS)

The DBAS was developed and validated by Morin et al. [1]. It was designed to assist clinicians in identifying sleep-disruptive thoughts that can be targeted in CBT-I. Originally containing 30 items to measure beliefs and attitudes regarding sleep, it was shortened to a 16-item scale [2] with the following contents: (1) need ≥8 h of sleep; (2) need to catch up on sleep loss; (3) consequences of insomnia on health; (4) worried about losing control of sleep; (5) insomnia interferes with my daytime functioning; (6) better off taking sleeping pills; (7) mood disturbance due to insomnia; (8) one poor night disturbs whole week; (9) cannot function without sleep; (10) sleep is unpredictable; (11) unable to manage consequences; (12) lack of energy due to poor sleep; (13) insomnia resulting from chemical imbalance; (14) insomnia destroying life; (15) medication as a solution; (16) cancel obligations. Items can be answered on a 10-step Likert scale. The scale differentiates between good sleepers and poor sleepers [1,17]. For our study the German version of the DBAS was used [18].

2.2.2. Pittsburgh Sleep Quality Index (PSQI)

The PSQI [19] is a standard instrument for measuring subjective sleep quality; a score of ≥6 is considered to be pathological. The German version [20] was used by healthy controls to ensure the absence of possible sleep disorders.

2.2.3. Regensburg Insomnia Scale (RIS)

The RIS was developed to measure the psychological symptoms of insomnia. It contains 10 items on sleep quantity and quality, sleep-related anxiety and worries, hypnotic intake, and daytime fitness. The RIS score correlates strongly with the PSQI score [14].

2.2.4. Polysomnography (PSG)

In the clinical routine setting, only one night of cardio-respiratory PSG recordings [electroencephalography EEG, electro-oculography, chin electromyography (EMG), airflow, oxygen saturation, respiratory effort, ECG, and EMG of the tibialis anterior muscle bilaterally] was performed and scored according to the manual of the American Academy of Sleep Medicine (AASM) [21]. Sleep stages were classified by a sleep specialist. Apneas and hypopneas as well as PLM were visually scored by a technical assistant and analyzed using a computerized PSG program (Nihon Kohden Neurofax with Polysmith). AHI and PLMI were calculated following the AASM rules [21].

The following sleep parameters were analyzed: sleep onset latency (SOL), total sleep time (TST), wake time after sleep onset (WASO), sleep efficiency (SE), defined as the ratio of total sleep time to time in bed, and the relative amounts of non-rapid eye movement (NREM) stage 1, NREM 2, NREM 3 and REM sleep. Subjective sleep variables of the preceding night were assessed by a questionnaire containing the following items: “How many minutes did it take you to fall asleep?” (subjective sleep latency; SubSOL); “How long did you sleep last night?” (subjective sleep time; SubTST) and “How long were you awake after you fell asleep?” (subjective wake time after sleep; SubWASO).

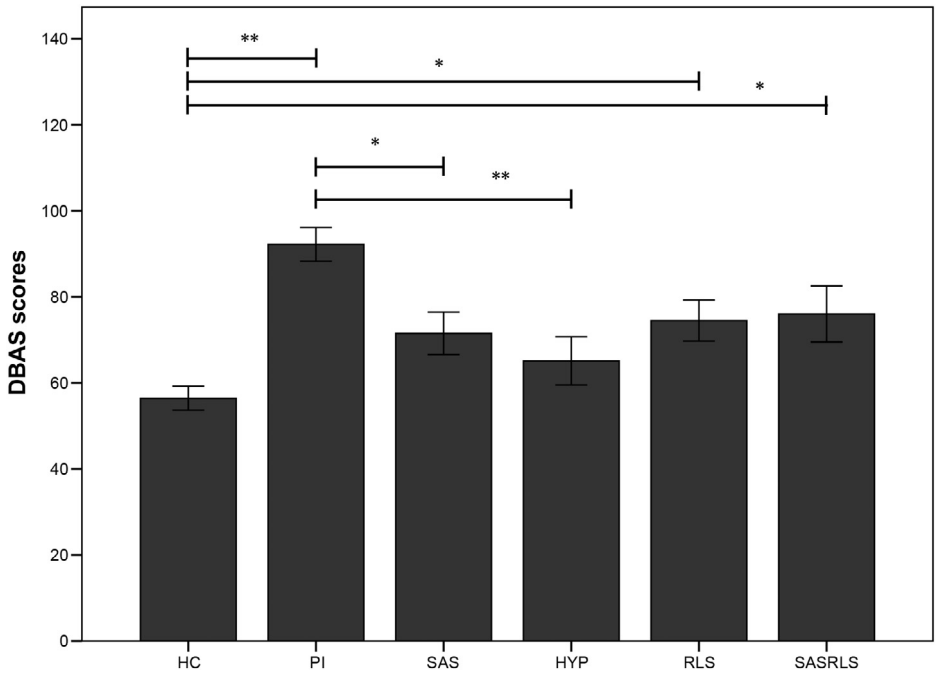

Fig. 1. Sum scores (means and standard errors of the means) of the Dysfunctional Beliefs and Attitudes Scale for each group of sleep disorders and healthy controls. Lines indicate significant differences as analyzed with t-tests and corrected with Bonferroni; level of significance $P < 0.05$ is indicated with *; $P < 0.005$ is indicated with **.

2.3. Analysis

DBAS sum scores were plotted for all groups. DBAS means were compared between all samples using analysis of variance (ANOVA) with one between-subjects factor group. Significance level for the ANOVA was set to 5% and was Bonferroni-corrected for the post-hoc tests. The same analysis was done with RIS scores, PSG data (TST, SOL, WASO, SE, NREM1, NREM 2, NREM 3, and REM sleep), and subjective sleep parameters (subSOL, subTST and subWASO). DBAS scores were correlated with PSG data and subjective sleep parameters for all patients using Spearman's correlation coefficient. DBAS scores were also correlated with the BDI score, the RIS total score, and each RIS item for the entire sample using Spearman's correlation coefficient. Data were analyzed using SPSS Version 20.

3. Results

The DBAS score differed significantly between groups (ANOVA: $F = 9.624$; $P < 0.0005$). The DBAS scores are displayed in Fig. 1 (mean DBAS score: HC, 56.54 ± 25.54; HYP, 65.12 ± 27.48; SAS, 71.53 ± 27.11; RLS, 74.52 ± 26.6; SAS + RLS, 76.0 ± 33.2; PI, 92.21 ± 22.8).

Post-hoc testing (Bonferroni) revealed that HC differed significantly from RLS ($P = 0.031$), SAS + RLS ($P = 0.020$), and PI ($P < 0.0005$). PI showed the highest scores and differed significantly from SAS ($P = 0.034$) and HYP ($P = 0.003$).

Table 2 shows PSG data of all sleep-disorder groups. HYP slept 407 ± 58 min whereas SAS + RLS patients only slept 338 ± 47 min. HYP slept significantly longer than all other groups. Post-hoc testing revealed that PI, SAS and SAS + RLS did not differ from each other in the amount of objective sleep.

All patient groups differed in the RIS score (ANOVA: $F = 13.384$; $P < 0.0005$). Post-hoc testing using Bonferroni correction revealed that PI differed from all other groups, showing significantly a higher score.

There were weak but significant correlations between the DBAS score and the following PSG variables: TST ($r = –0.218$; $P = 0.009$); WASO ($r = 0.238$, $P = 0.004$); N2% ($r = –0.253$; $P = 0.008$) and SE% ($r = –0.218$; $P = 0.009$). There were no correlations between the DBAS score and SOL, and the relative amounts of NREM 1, NREM 3, or REM sleep. Correlation coefficients between subjective sleep parameters and DBAS score were moderate: subSOL (0.346; $P < 0.0005$); subTST (–0.300; $P < 0.0005$); and Sub WASO (0.470; $P = 0.0005$).

For all patients and the control group there was a significant correlation between the DBAS and the severity of the psychological symptoms of insomnia measured with the RIS ($r = 0.603$; $P < 0.0005$). The DBAS correlated significantly with each RIS item, the correlation being most pronounced with item 8 ("being afraid to go to bed") (Table 3). The correlation coefficient between the DBAS score and the BDI was moderate ($r = 0.528$; $P = 0.0005$). There was no correlation between age and DBAS.

4. Discussion

To the best of our knowledge, this is the first study on the presence of dysfunctional cognitions about sleep in different groups of sleep disorders. The main result is that dysfunctional cognitions about sleep are not only significantly higher in patients with PI but also in patients with RLS and SAS + RLS as compared to healthy controls. The finding that our SAS patients do not show higher DBAS scores does not refute earlier results, demonstrating that the presence of insomnia in SAS patients seems to be the decisive factor for the occurrence of dysfunctional thinking [13]. Our data extend these results, showing higher DBAS scores in RLS and SAS + RLS patients, thus underscoring that dysfunctional thinking about sleep may occur associated with insomnia symptoms in other sleep disorders.

The occurrence of dysfunctional attitudes and beliefs in sleep disorders such as RLS or SAS comorbid with RLS gives evidence for the need to broaden the regular diagnostic spectrum in these patient groups, e.g. by administering insomnia scales. The increased scores may point to a significant involvement of dysfunctional thinking about sleep in the persistence of insomnia in sleep disorders and in sleep impairment in general, even if insomnia symptoms remain on a subclinical level. Since insomnia symptoms can be efficiently

Table 2
Sleep parameters in different groups of sleep disorders.

	PI ($n = 34$)	SAS ($n = 30$)	HYP ($n = 24$)	RLS ($n = 31$)	SAS + RLS ($n = 26$)	F	Significant differences[a]	P-values (ANOVA)
TST (min)	331.7 ± 77.3	324.1 ± 86.2	407.4 ± 57.9	343.7 ± 86.7	338.1 ± 46.7	5.159;	PI < HYP	0.002
						$P = 0.001$	SAS < HYP	0.001
							RLS < HYP	0.019
							SAS + RLS < HYP	0.012
SOL (min)	21.6 ± 24.8	27.1 ± 44.2	10.2 ± 14.6	16.1 ± 15.9	18.4 ± 23.0	NS		
WASO (min)	83.2 ± 61.4	81.7 ± 60.9	34.7 ± 38.1	69.0 ± 52.2	82.2 ± 46.0	3.806;	HYP < PI	0.009
						$P = 0.006$	HYP < SAS	0.018
							HYP < SAS + RLS	0.020
SE (%)	74.8 ± 16.6	74.0 ± 18.9	89.8 ± 8.2	78.6 ± 18.3	76.9 ± 11.6	4.238;	PI < HYP	0.005
						$P = 0.003$	SAS < HYP	0.004
							SAS + RLS < HYP	0.042
NREM 1 (%)	12.2 ± 11.2	15.0 ± 5.4	8.4 ± 3.5	15.0 ± 13.6	17.2 ± 6.6	3.326;	HYP < SAS + RLS	0.012
						$P = 0.012$		
NREM 2 (%)	41.3 ± 10.3	41.7 ± 11.6	44.8 ± 8.8	40.7 ± 10.8	41.7 ± 10.8	NS		
NREM 3 (%)	14.7 ± 10.3	12.6 ± 8.8	20.3 ± 9.5	14.6 ± 9.4	9.5 ± 10.4	4.032;	SAS < HYP	0.049
						$P = 0.004$	SAS + RLS < HYP	0.002
REM (%)	13.0 ± 6.4	9.8 ± 6.2	18.0 ± 6.3	13.7 ± 5.8	12.0 ± 6.0	6.078;	PI < HYP	0.029
						$P < 0.0005$	SAS < HYP	0.0005
							SAS + RLS < HYP	0.008
SubSOL (min)	80.52 ± 96.2	61.1 ± 64.5	48.9 ± 81.9	45.2 ± 50.5	45.3 ± 28.3	NS		
SubTST (min)	261.75 ± 109.3	296.4 ± 110.7	360.4 ± 99.4	321.5 ± 94.8	299.9 ± 99.5	3.390;	PI < HYP	0.005
						$P = 0.011$		
SubWASO (min)	133.76 ± 100.0	78.5 ± 84.1	45.3 ± 88.6	63.3 ± 68.9	74.2 ± 79.6	4.511;	HYP < PI	0.002
						$P = 0.002$	RLS < PI	0.014

Abbreviations: PI, primary insomnia; SAS, sleep apnea syndrome; HYP, hypersomnia; RLS, restless legs syndrome; SAS + RLS, SAS comorbid with RLS; ANOVA, analysis of variance; TST, total sleep time; SOL, sleep onset latency; WASO, wake time after sleep onset; SE, sleep efficiency; NREM 1–3, relative amounts of non-rapid eye movement stage of sleep period time, NREM 2, NREM 3 and REM sleep; SubSOL, subjective sleep onset latency; SubTST, subjective sleep duration; SubWASO, subjective wake time after sleep onset; NS, non-significant.
Values are means ± standard deviation.
[a] After Bonferroni correction.

treated with CBT-I, our data suggest that further studies investigating the effects of CBT-I in other sleep disorders are warranted.

The weak correlation between the DBAS scores and objective sleep parameters confirms the finding that dysfunctional thinking is more likely to be related to psychological factors [2]. Consistently, higher correlations between the DBAS and subjective sleep parameters as well as between DBAS and psychological items have been found. However, our study suggests that the relationship is valid not only in primary insomnia but also in other sleep disorders.

The moderate correlation between DBAS and BDI was expected, since dysfunctional thinking is a solid finding in depressed patients and has been described in a cognitive model by Beck [22,23]. The BDI measures dysfunctional attitudes that are a part of depression. However, the correlation in the present study suggests that dysfunctional thinking may play an important role in the relationship between insomnia and depression [24], a link that may be confirmed by further research.

Table 3
Correlation between items of the Regensburg Insomnia Scale (RIS) and the Dysfunctional Beliefs and Attitudes about Sleep Scale score.

RIS items	Spearman's rho	P
Sleep latency	0.311	0.0005
Hours of sleep	0.294	0.0005
Sleep continuity	0.389	0.0005
Early awakening	0.404	0.0005
Easy awakening	0.416	0.0005
Experienced sleepless nights	0.462	0.0005
Thinking about sleep	0.552	0.0005
Afraid to go to bed	0.563	0.0005
Feeling fit during the day	0.485	0.0005
Using sleep medication	0.463	0.0005
Sum score	0.603	0.0005

There are some limitations to our study that need to be addressed. First, groups of patients have different sample sizes. This is due to the specific design of our study, i.e. all consecutive patients attending the sleep center in a predefined time window were screened for study participation. However, the advantage of this procedure is a reduction of the patient selection effects as a potential confounder. Second, the lack of PSG data in healthy controls enables the comparison between questionnaire scores and objective sleep variables only in the patient groups. However, a comparison between questionnaire scores and PSG data in controls is not critical with respect to the primary goal of the study.

5. Conclusion

Dysfunctional cognitions are highly prevalent in insomnia patients and are also present in patients with RLS and SAS + RLS. Our study indicates that these sleep disorders deserve more diagnostic attention regarding possible insomnia-specific symptoms. Moreover, our data suggest that the investigation of CBT-I as an adjunctive treatment option in patients with such organic sleep disorders may be promising.

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None.

Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: http://dx.doi.org/10.1016/j.sleep.2014.06.018.

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